

A note on the discovery of Thanasimus sp.¹ prox. nigricollis in the N.-W. Himalayas with some remarks on its life-history.—By E. P. STEBBING.

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In June 1902, whilst touring in the Tehri Garhwal forests in the N.-W. Himalayas, the writer discovered and took a number of specimens of both larvæ and beetle of a species of *Thanasimus prox. nigricollis* Lewis, a beetle belonging to the family *Oleridæ*. The insect was submitted to the well-known specialist, the Rev. H. S. Gorham, who has reported that, with the exception of a few minute differences which will require comparison with the types to settle, the insect is identical with G. Lewis' *T. nigricollis*, taken by the latter in Japan and described in the Ann. Soc. Nat. Hist., Vol. X (1892), p. 187. It is owing partly to these minute differences to its greater size and perhaps to a certain extent to the fact that there appears to be a curious close relationship between the insects found in parts of Japan and some of those of the N.-W. Himalayas, that I at present put the species as *prox. nigricollis*. In the case of another predaceous insect a *Niponius* (the first species of which genus were found by Lewis in Japan) the N.-W. Himalayan one has proved to be a different species to Lewis' Japanese ones.

I think it may be shown that the discovery of this *Thanasimus* is one of very considerable importance, since it is predaceous upon several bark and wood boring *Scolytidæ* which have been recently discovered to commit serious damage in the coniferous forests of the N.-W. Himalayan area. My observations tend to prove that it takes the place in this region of the well-known *Thanasimus formicarius* of the European coniferous forests. This latter clerid preys upon (to mention but two) the larvæ and adults of *Myelophilus piniperda* and *M. minor* which are amongst the principal scolytid enemies of the European pine forests, and is in consequence very rightly looked upon as an insect ally of the greatest value to the forester in those regions. So great, in fact, is the value attached to its predaceous habits that it was imported into some of the coniferous forests of North America in 1892. The initiation of this experiment, the first of its kind to be undertaken on a larger scale (in forest areas), came about in the following manner:—Between 1900 and 1902 the pine trees in portions of Hampshire, Hardy, Grant, Pendleton, and Mineral counties, West Virginia; Bath, Highland, Augusta, and Rockingham counties, Virginia and also in portions of Maryville, died off in large numbers, the destruction being widespread and in some places universal. This wholesale mortality was soon traced to its origin, as countless numbers of small bark-beetles were found

¹ *Olerus* sp. Steb. Dept. Notes Ins. aff. For. No. 2, p. 213 (1903).

breeding in the bark of the trees, the depredator being *Dendroctonus frontalis*. So greatly had the insect increased that healthy trees were attacked equally with sickly ones. Dr. D. A. Hopkins, Entomologist to the West Virginia Agricultural Experiment station, made several tours of examination of the infected areas, and his observations showing him that there were no predaceous or parasitic insects of sufficient importance in the forests to cope with the attack, he suggested the importation of some European ones. A study of the question narrowed this suggestion down to the experimental introduction of *T. formicarius*, and with assistance of some of the great Lumber Companies, who were being seriously affected by the widespread deaths of the trees in large areas of forest owned by them, funds were made available to enable Dr. Hopkins to visit some of the European coniferous forests with a view to the collection of the clerid and its importation to the other side of the Atlantic. This experiment was conducted to a satisfactory conclusion. I think the above short note will prove that the discovery of the presence of a similar insect in the great and important coniferous forests of North Western India is not without a considerable economic as well as scientific value.

I give the following descriptions of the adult and larva:—

Beetle. Elongate stout and robust. Head and antennæ black. Antennæ 11 jointed with joints slightly increasing in width upwards, the last three forming a small club, the last joint of which is largest. Prothorax black and hirsute dorsally. Elytra under the prothorax broad, and rounded at their apices; red on the basal quarter of their length, then black, the black being twice crossed by white wavy bands, the first a narrow one just above the juncture of the black with the red colour, this band being reflexed backwards towards the apex and not upwards as in *formicarius* and in other species, and the other a broad one placed about $\frac{3}{4}$ of their length up from the base. There is also a small white patch at the extreme apex. Legs black. Abdomen a bright vermilion red, its segments very mobile. Body somewhat short, flattened, pubescent. Long ♂ 7.5–9 millim. ♀ 9–11 millim.

I would suggest, with Mr. Gorham's permission, that the species, should it prove new (at this distance from the types I am unable to speak with any certainty upon this point) should be named *himalayensis* since it would be useful to mark the locality where so important an insect to foresters was discovered.

Larva. General colour a bright pink. Head brown, flat, mandibles black. A brown dorsal patch on 1st thoracic segment and pair of brown spots situated dorsally on each of the two succeeding segments. These thoracic segments a paler pink than the following abdominal ones. Latter nine in number, bright pink to reddish pink

except last which is narrower and brown posteriorly and terminates in two small black processes. The larvæ tapers anteriorly and has three pairs of legs on the thoracic segments and no others. It is slightly lighter in colour beneath. Long. 15-18 millim. (varies). A single specimen of the beetle was first taken on the 16th June at Kathian, in the Jaunsar Hills, but it was not until the 24th of the month that the insect was secured in any numbers; this was in the forests round Pajidhar in Tehri Garhwal. Some deodar fellings were being carried out in these forests, and trees, cut at the end of April and still lying unbarked upon the ground, were found to be full of the larvæ and adults of two recently discovered bark-boring Scolytidæ, *Scotylus major* and *S. minor*, Steb. MS. The *Thanasimus* was discovered in some abundance, flying about over the trees or running about on the bark, whilst in the beetle and larval galleries beneath the latter its pink-coloured larvæ were numerous.

Before describing the life-history of the clerid, it will perhaps be advisable to describe the state of affairs at Pajidhar. It has been mentioned that deodar fellings had commenced towards the end of April, and were still being carried on at the time of the writer's visit. The trees cut were not barked, or in any way touched, until converted into timber—chiefly sleepers. They therefore lay several months in the forest. The scolytid beetles above referred to commence laying the eggs of the first generation of the year towards the end of April or beginning of May. For this purpose they require the fresh bast layer of the deodar, preferring sickly trees and, more especially, newly felled ones in which the upward flow of sap has ceased. Failing such they will attack young, green, healthy trees. At Pajidhar the fellings had commenced at a most opportune time for the bark-borers and large numbers of females were attracted to the newly felled trees and at once burrowed into them and oviposited. Towards the end of June the larvæ from these eggs were full grown, and in many cases had changed to the pupal state. The larvæ were being attacked by the predaceous clerid grubs. A curious point about the life-history of these scolytid beetles, is that the female does not die as soon as she has finished laying her eggs, but remains in the long egg-gallery she bores in the bast layer and sap wood parallel to the long axis of the tree, or in the entrance gallery in the bark, and lives here until the larvæ are full grown, at times going up to the outside. When she finally dies she does so near the entrance hole, thus effectually blocking it up and preventing predaceous enemies from entering and feeding upon the pupæ at the end of the larval burrows. It would appear probable that this prolongation of life after oviposition is in some way connected with the protection of the young larvæ. It was upon these female scolytid beetles that the adult clerid was feeding.

Life History. It is possible that the *Thanasimus* is to be found on the wing more or less continuously from spring to the end of autumn in the localities which it affects. The eggs have not yet been discovered, but they are probably laid on the bark of the trees near or in the entrance holes of the bark beetles, and the young larvæ, or hatching out, make their way down these tunnels into the egg galleries in the bast and sap wood and from thence into the larval galleries. My observations up to the present have shown that larvæ of all sizes are generally to be found in these situations between May and October. The length of time spent in the larval stage is at present unknown, but it is unlikely to be more than a month in the case of the summer generations. On becoming full grown the grubs go into the thick outer bark of the tree to pupate. This is to facilitate the beetle when mature leaving the tree. The adult never enters the tree. It is a brightly-coloured, very active insect, running and flying well even in hot sunshine, and it spends its life flying round or running about on the bark of the trees. Its food consisting of bark and wood boring *Scolytidæ*, it searches for these on the bark, since it is much too bulky to enter their tunnels, and seizes them whilst they are engaged in either boring into or tunneling their way out of the tree. In the case of the *Scolytus major* and *minor* beetles, upon which it was preying when discovered, it would appear that they form its food for some weeks or months during the year, since they remain alive after egg-laying and until the larvæ are full grown. The mother beetles spend their time walking up or down the egg-gallery, or going up the entrance hole to the outside and the *Thanasimus* watches at the mouth of these holes and seizes and devours the beetles when they appear at the mouth of the tunnel. They only feed upon living beetles, and will not touch dead ones, and they catch their prey by sight only and not by scent: unless the bark beetle is right in front of them they will pass it by unnoticed. I was able to definitely ascertain this point by a number of experiments. Beetles kept for twenty-four hours without food passed close to their prey without noticing it although they were in a ravenous condition. It would appear that they only see directly in front, and this is borne out by the position of the eyes which are placed rather forwardly upon the head. When, however, the scolytid comes within their range of vision they pounce upon it, just as a tiger does, with one rush and if out of its hole the bark beetle has not the remotest chance of escape. I have not been able as yet to observe whether they ever take their prey upon the wing. The clerid seizes the bark-borer with its anterior legs and mandibles, picks it up off the ground, turns it round so as have the ventral surface facing it with the head uppermost, sits well back on its hind legs and commences to feed upon its

prey, whose struggles are quite ineffectual in that deadly grip. In commencing to devour the scolytid it invariably begins with the head; it fastens its mandibles round the junction of the head and prothorax, following the parallel of the tiger, and chews and sucks at the head until it has finished this completely. It next goes to work on the prothorax, piercing with ease through the hard chitinous shell with its powerful mandibles and breaking it to pieces, the contents being entirely cleaned out and consumed, for the beetle is a neat feeder, and entirely clears the meat off the chitinous bone before rejecting it. Having finished the prothorax, it throws away the mangled shell and turns its attention to the body consisting of the meso- and meta-thorax and abdomen. In a bark beetle this is often in the shape of a blunt elliptical cylinder with a flattish top where it joins the prothorax. The beetle holds this between its front legs, the meso-thoracic end upwards, and proceeds to first pull off the elytra which are rejected: the under wings being consequently released open out to their full extent but remain attached to the trunk. The clerid then entirely cleans out this bottle-shaped cylinder, as neatly as one could clean out a jar with a spoon. When quite empty, it is thrown away and the insect starts off in search of another bark-beetle. A mangled prothoracic shell and the empty chitinous body cylinder with the outspread lower wings attached to it are all that are left of a *S. major* beetle six minutes from the moment it was captured alive. I have seen three such eaten consecutively, and of 20 beetles put in with four clerids only the above mentioned portions remained when the box was inspected $3\frac{1}{2}$ hours afterwards. As has been already mentioned the resemblance between this insect and the tiger in its methods of rushing upon, seizing, and commencing to feed upon its prey is remarkable, the difference being that the insect is more cruel than the mammal since it makes no pretence of killing the bark-beetle, but commences on it whilst it is alive and kicking, often bringing forward its middle pair of legs to assist in holding its struggling prey. As an instance of its tenacity and rapacity I may quote the following. In common with most insects the clerid dislikes being upon its back and when so placed makes violent efforts to right itself. A beetle had been placed in a tube with two *Platypus* (*Platypodæ*) beetles. It at once seized one and, though shaken violently about, clung to its victim and, falling on its back and finding it impossible to right itself at once, gave up the attempt and consumed its prey in this position, before restarting its struggles to resume the normal position. It then made an effort to seize the second *Diapus* but was removed as the writer wished to preserve the latter. The insect is polygamous. A ♂ kept in a box with three ♀ and fed with bark borers for four days, paired with one or other of the three whenever it was not

feeding or searching for its prey. In pairing the ♂ rushes at the ♀ from behind with the same impetuosity with which it pounces upon its prey, mounts on her back and thrusts the tip of his very flexible abdomen downwards, curling it round till it reaches the tip of the abdomen of the ♀. The latter is at times larger than the ♂ though it may be of the same size. She walks about carrying the male whilst pairing lasts. I have not yet ascertained how long the beetles spend in the adult stage of their life-history. It is evidently several days and may extend to a week or two. We have seen that larvæ of all sizes (and consequently probably ages) are to be found in the scolytid larval tunnels during the spring and summer months (they have been so found in May, June, July, August, and September) and therefore with the long life of the beetle it is probable that the generations overlap, this meaning a continuous supply of larvæ and beetles throughout the spring, summer, and autumn. It will be shown later on how excessively important this fact is.

To sum up my observations on the habits of the ♂, I may say that when not eating or searching for bark-beetles it is pairing or *vice versâ* and the ♀, at any rate up to the time she commences egg-laying, appears to be an equally large and voracious feeder. Since the insect is fully twice as large as its European confrère, being from 8 to 10 millim. and more in length, whilst the bark-beetles are much of the same size as the European ones, from 2.5 to 5.5 millim., it is naturally capable of consuming in its lifetime a far larger number of beetles and it will therefore be readily understood that the beetle is a valuable ally to have in forests where bark-boring insects may assume the form of serious pests in seasons favourable to themselves.

Food. With the exception of one specimen taken on the wing in the middle of June, which was probably feeding upon *Diapus impressus* Jans., the insect may be said to have been first discovered feeding upon *Scolytus major* and *minor* in Deodar on the 24th June. From the study of the life-histories¹ of these latter beetles, which I have been able to make, it is certain that they are to be found in the adult state from the end of April (the beginning of spring when insect life commences to re-awake in the N.-W. Himalayas after its winter hibernation) to the end of June, or perhaps as late as the end of the first week in July. The beetles from the eggs laid at the end of April and beginning of May, begin to appear on the wing at the end of July or early in August and are to be found throughout that month and on into September. It is thus evident that with but a short interval of three weeks or so this form of food-supply is available for the clerid from its resumption of

¹ Vide Steb. Depart. Notes on Ins. aff. For., No. 1, p. 45. *Id.*, No. 2, pp. 203-212.

activity in the spring until the autumn. That the insect has an adequate food-supply will be evident from the following facts:—

From calculations made from measurements and countings taken in the forest I estimated that in a deodar tree of a hundred feet length of bole and three feet diameter at base which had been felled at the end of April and in which the scolytids had deposited their eggs in the bast layer from top to base, a first generation of some 56,300 adults was produced in July-August. Taking but 50 per cent. of the eggs (*S. major* lays about 60 and *S. minor* 40 per brood) laid (these being those of the second generation of the year) by these 56,300 beetles as arriving at maturity, we have the enormous total of 1,550,000 beetles at the end of the year, the result of the eggs laid in but one tree in the spring. I may say that in this calculation large deductions have been made to allow for over-estimation, &c., the large number of beetles which oviposited in the giant crown of the tree and their resultant offspring being left out of account altogether. Experiment has shown, however, that the *Thanasimus* is by no means dependent upon the *Scolytus* beetles for its food-supply as it will devour with almost, if not quite, equal avidity, various other scolytid pests found in the region of its known activity. I have fed it with the following beetles:—

1. Bark-boring species (*i.e.*, those species which confine their attacks to the bast layer of the trees attacked).

<i>Scolytus major</i> Steb. MS.	} mentioned above (Deodar).
<i>S. minor</i> Steb. MS.	
<i>Polygraphus major</i> Steb. MS.	} (Blue pine and Spruce).
<i>P. minor</i> Steb. MS.	
<i>Pityogenes coniferæ</i> Steb. MS.	} (Blue pine, Deodar and <i>Pinus Gerardiana</i>).
<i>Tomicus</i> sp. (Blue pine and Spruce).	

2. Wood-boring species (*i.e.*, those species which bore right into the wood of the tree and oviposit in it).

<i>Rhyncholus</i> sp. (Blue pine, Spruce, and perhaps Deodar)
<i>Hylastes</i> sp. (Blue pine and Spruce).
<i>Diapus impressus</i> Jans. (<i>Quercus incana</i>).
<i>Platypus</i> ? sp. (Deodar).

All the above are coniferous insects, with the exception of the *Diapus impressus* which bores into the wood of the oak *Quercus incana*.

This *Thanasimus* would therefore appear to be fairly omnivorous where bark-beetles are concerned, attacking freely many different species and in this resembling its European confrère *T. formicarius*.

I think the above short note on its habits will support and confirm the opinion held by the writer, as to the great value and importance of the presence of such an insect in the N.-W. Himalayan Coniferous Forests.